REMARKS

Claims 1-20 and 22-29 are pending in the present application.

Claims 1-6 and 8-15 are allowed.

Claims 7, 16-20 and 22-29 are rejected.

REJECTIONS UNDER 35 U.S.C. 112

Claims 7 and 16-29 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office opines that present claims 17, 18, 22 and 23 are duplicates and that claims 7 and 16; 17, 18, 22 and 23; 19 and 24; 20 and 25; 26 and 28,as well as 27 and 29 are all duplicate claims.

The claims are considered to be duplicates based on the premise that the double jet method does not distinguish the particles of claim 16 from those of claim 7. The same argument is applied to claims 19 and 24 as well as 20 and 25. Enclosed herewith is a declaration under 37 C.F.R. §1.132 from Dr. Andriessen, the inventor of the present application. In the declaration Dr. Andriessen discloses that ZnS: Mn,Cu particles prepared using different precipitation techniques exhibit vastly

different electroluminescence properties depending upon the precipitation technique used. We therefore contend that claims 7, 16, 19, 20, 24 and 25 are distinct claims and hence proper under 35 U.S.C. §112, second paragraph.

Claims 17, 18, 22 and 23 are considered to be duplicates based on the premise that the double jet method of precipitating and the method of forming the citrate or EDTA complex of Cu(I) does not distinguish the particles of claim 17 from those of claims 18, 22 and 23. The same argument is applied with regards to claims 28 and 26 as well as 27 and 29.

The declaration under 37 C.F.R. § 1.132 from Dr Andriessen, the inventor of the present application, discloses that ZnS: Mn,Cu particles prepared using different precipitation techniques exhibit vastly different electroluminescence properties depending upon the precipitation technique used. Furthermore, as also disclosed in the enclosed declaration from Dr. Andriessen, the Cu(I) source used to form an EDTA complex of Cu(I) has a significant effect on the electroluminescence observed, its having a much shorter lifetime with both poly(vinyl pyrrolidone) and PEDOT/PSS as binder and also a considerably higher brightness with PEDOT/PSS as binder, whereas the inverse was observed in the case of the EDTA complex of Cu(II). We therefore contend that claims 17, 18, 22 and 23 are

distinct claims and hence proper under 35 U.S.C. §112, second paragraph.

The declaration clearly sets forth the difference in the product prepared by the process set forth in the claim. A rejection, or objection is improper.

Applicants have conclusively shown, in the form of a declaration under 37 C.F.R. § 1.132 that the double jet method of precipitation and the method of forming the citrate or EDTA complex of Cu(I) forms readily distinguishable ZnS:Cu particles therefore claims 16, 18, 22-25, 28 and 29 are patentably distinct inventions relative to claims 7, 17, 19, 20, 26 and 27.

In conclusion, Applicant submits that claims 7 and 16-29 comply with 35 U.S.C. §112, second paragraph. Withdrawal of the rejection is respectfully requested.

REJECTIONS UNDER 35 U.S.C. 103

Claims 7 and 16-29 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gray et al. in view of Fischer.

The Office opines that the references suggest thin film inorganic light emitting diode devices comprising a coated layer comprising ZnS:Cu particles produced by co-precipitation which can be coated by an anti-agglomeration compound. The Office further opines that the particles of Gray et al. appear to be

identical to the ZnS:Cu particles of claims 7 and 16-29, which are set forth in product-by-process claims.

The Office further opines, in contradiction to Applicants previous arguments that Applicant has not presented any evidence that the displays of Grey et al do not have the structure of the displays taught in column 1, line 5-45 in Fischer.

Gray et al. only exemplifies ZnS:Mn phosphors. Gray et al. only discloses that particles produced according to the claimed process exhibit photoluminescence. Gray et al. does not disclose that particles produced according to the claimed process exhibit electroluminescence *per se* and electroluminescence in a thin film inorganic light emitting diode device in particular. One skilled in the art would know that all inorganic particles exhibiting photoluminescence do not exhibit electroluminescence in that completely different emission processes are involved in these two types of emission. Dr. Andriessen discloses in his declaration that ZnS:Mn particles, produced according to a double jet process as disclosed in the present application, do not exhibit electroluminescence in a thin film inorganic light emitting diode device.

The Office contends that the particles of Gray et al. appear to be identical to the ZnS:Cu particles of claims 7 and 16-29,

which are product-by-process claims and that the particles are not different.

Dr. Andriessen discloses in his declaration that ZnS:Mn particles, produced according to a double jet process as disclosed in the present application, exhibit photoluminescence having a λmax of 595 nm and that they emit in the wavelength range of 525 nm to above 700 nm which is significantly shifted with respect to the ZnS:Mn particles prepared according to the process of Gray et al. This provides evidence that the processes according to the present application produce particles with significantly different photoluminescence properties and hence with significantly different microstructure to those disclosed in Gray et al.

At Col. 5, lines 24-34, Gray et al alludes to the possibility of applying the process of claim 1 of Gray et al. to phosphors other than ZnS:Mn:

> "Some examples of host-activator/dopant pairs according to the method of the present invention include: ZnS:Mn; ZnS:Cu,Mn; ZnS:Cu; ZnS:Ag; ZnS:Cu,Cl; ZnS:Eu; ZnS:Cu,Tb; ZnS:Tb; ZnS:Ag,Cl; ZnS:Cu,Al; $Zn_xCd_{1-x}S$:Mn; $Zn_xCd_{1-x}S$:Ag,Cl; $Zn_x Mg_{1-x}S$:Mn; SrS:Mn; SrS;Ce; CaS:Mn; CaS:Er,Cl; CaS:Tb; and ZnO:Zn. Other possible phosphors that may be made according to the present invention include: ZnS:Cu.Mn; ZnS:Cu; ZnS:Ag; ZnS:Cu,Cl; ZnS:Eu; ZnS:Cu,Tb; ZnS:Tb; ZnS:Ag,Cl; ZnS:Cu,Al; $Zn_xCd_{1-x}S$:Mn; $Zn_xCd_{1-x}S$:Ag,Cl; $Zn_xMg_{1-x}S$:Mn; SrS:Mn; SrS;Ce; CaS:Mn; CaS:Er,Cl; CaS:Tb."

Applicant contends that since ZnS:Mn particles produced by double jet precipitation techniques as disclosed in the present invention exhibit emission properties significantly different from those produced using the process of Gray et al., ZnS:Cu(I) particles produced using the process of Gray et al. would exhibit significantly different emission properties compared with those reported in the present application using double jet precipitation techniques.

Furthermore, Applicant contends that incorporation of copper ions *per se* into ZnS does not necessarily lead to a ZnS:Cu particle which luminesce in a thin film inorganic light emitting diode device. For example, Examples 1 to 3 of the present application illustrate that no photoluminescence is observed in the absence of the complexants tetrasodium EDTA or triammonium citrate. Applicant therefore contends that the recitation of a ZnS:Cu,Cl phosphor in the list at column 5, lines 24-34, may neither be regarded as enabled for a phosphor exhibiting photoluminescence nor for a phosphor exhibiting electroluminescence in a thin film inorganic light emitting diode device, since, according to Examples 1 to 3 of the present application, incorporation of CuCl *per se* does not produce a ZnS:Cu,Cl phosphor which even exhibits photoluminescence. We contend that a complexant such as tetrasodium EDTA or triammonium citrate is necessary to ensure that sufficient

copper ions are incorporated into the ZnS lattice to ensure photoluminescence and electroluminescence in a thin film inorganic light emitting diode device. Gray et al. does not disclose the co-use of a complexing agent such as tetrasodium EDTA or triammonium citrate in producing ZnS:Cu,Cl phosphors and therefore the ZnS:Cu,Cl phosphors disclosed cannot be regarded as enabled with regard to such phosphors exhibiting photoluminescence and electroluminescence in a thin film inorganic light emitting diode device.

Moreover, the photoluminescence properties of control examples disclosed in the present application (Examples 1 to 3) prepared according to standard precipitation process are significantly inferior to those of the invention examples of the present application prepared according to the process of the present invention. We contend that such differences in properties reflect differences in the phosphors and hence that significantly different ZnS:Cu phosphors are realized according to the present invention with significantly better photoluminescence and electroluminescence properties with respect to prior art ZnS:Cu phosphors.

Fischer in claim 1 discloses:

"A display panel comprising a body of insulating resin having a layer of electroluminescent particles embedded therein, said layer being a

single particle in thickness, said resin having a dielectric constant higher than that of said particles and said resin including fluorescent material on at least one side of said layer, insulating coatings on both front and back surfaces of said resin body, a transparent front electrode extending over the insulating coating on said front surface, a back electrode disposed on the insulating coating on said back surface, at least one element of said display panel adjacent the back thereof being black and sufficiently opaque to absorb substantially all the light reaching it, and means for electrically energizing said electrodes."

The Office opines that Gray et al. teach ZnS:Cu particles produced by co-precipitation which can be coated by an anti-agglomeration compound. These particles are argued to be usable in electroluminescent displays and that Fischer shows these displays have the same structure as the claimed thin film inorganic light emitting diode devices.

Applicants contend that, since Gray et al. can only be construed as teaching ZnS:Cu,Cl particles exhibiting photoluminescence, one skilled in the art would have no

motivation for combining the teaching of Gray et al. regarding photoluminescing ZnS:Cu,Cl particles to the device of Fischer et al. requiring electroluminescent particles.

Moreover, at col. 12, lines 20-43, Fischer discloses:

> "In the past, recipes for white-emitting EL powders have been published. We found, however, that these white-emitting ZnS:Cu,Mn powders increase the color temperature of their white emission as the drive frequency is increased. Above 5 kHz drive frequency, they fail altogether since the yellow ZnS:Mn emission band saturates whereas the blue ZnS:Cu,Cl band of the emission keeps becoming brighter. However, as explained before, in order to obtain high brightness it is very desirable to drive these panels at frequencies as high as possible, for example, at 10 kHz.
> According to the invention, there are several solutions to this problem. We found that a white-emitting mixture can be prepared which has high brightness at 10 kHz and which is insensitive to changes of the drive frequency. It consists of an intimate physical mixture of either blue-emitting ZnS:Cu,I or blue-emitting ZnS:Cu,Al phosphor powder, with yellow-emitting $ZnS_{0.2}Se_{0.8}$:Cu,Al powder, in the ratio of 30 to 70 weight percent. By increasing the blue proportion, cool-white emission can be obtained, by increasing the yellow proportion, warm-white emission is achievable quite easily. Details about phosphor preparation will be given later."

This clearly teaches away from the use of ZnS:Cu phosphors in the display panel comprising a body of insulating resin having a layer of electroluminescent particles embedded therein according to claim 1 of Fischer.

Applicant therefore contends that claims 7 and 16-29 are patentable under 35 U.S.C. §103(a) over US 6,090,200 (Gray et al.) in view of US 4,143,297 (Fischer).

CONCLUSIONS

Claims 1-20 and 22-29 are pending in the present application. All claims are believed to be in condition for allowance. Notice thereof is respectfully requested.

Respectfully submitted,

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